9. Applications

This chapter includes the standards guidance for the software components that support specific operational and business functions. The relationship of this chapter with the ITSG is shown in Figure 9-1.

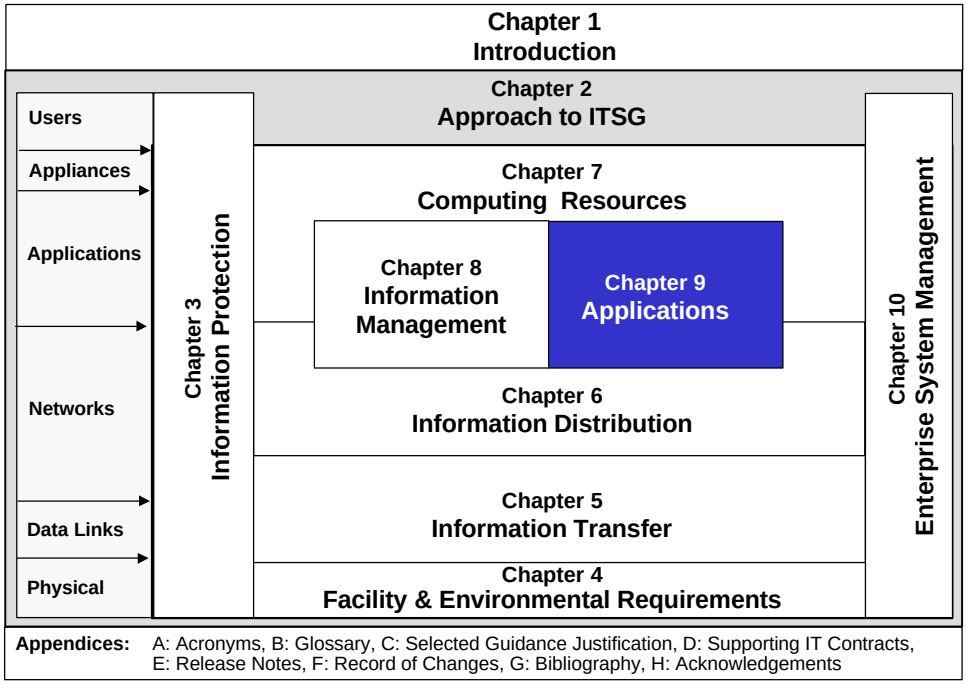


Figure 9-1. ITSG Document Map highlighting Chapter 9, Applications

9.1 Overview

9.1.1 Background

Applications consist of hardware and software components that support specific operational and business functions, including C4ISR systems that allow the warfighter to selectively pull in timely targeting information, the navigator to display cartographic information, and for the logistician to locate a critical spare part necessary to complete a mission. They include the common tools by which people across the Navy and Marine Corps prepare text documents, analyze daily activities, develop and present mission briefings, and make decisions. Applications are the myriad of tools by which the DON leverages IT to support its improved processes and thereby realizes large order of magnitude gains in information superiority and worker productivity with commensurate reductions in cost.

Applications are dependent upon an enterprise architecture and standards for integration, effectiveness and interoperability. The operational architecture defines the requirements, conditions and performance levels for information exchange. The systems architecture identifies the specific applications that perform the mission tasks and business functions — where those applications reside, who controls them, what systems they interoperate with, and who accesses them.

An application is a user's agent to do the required work within the information infrastructure. Chapter 8 describes "information" as the payload of the infrastructure, and Chapter 6 describes the 'envelope' for the data (e.g., MIME types). "Applications" comprise the factory that processes the payload to turn out the final product — operational capability. Applications transform information and produce a capability to better understand the situation, make better decisions, issue clear direction, create and promulgate new information, and allow people to communicate.

The ITSG document map, Figure 9-1, depicts applications and information at the core of information technology and they are surrounded by computing resources and information distribution technologies. This illustrates the role applications play in processing information using the computer resources and disseminating the resultant products to the user via a human computer interface of the information distribution network. Figure 9-2 shows the relationship of applications to the information infrastructure using a modified form of the DOD Technical Reference Model.

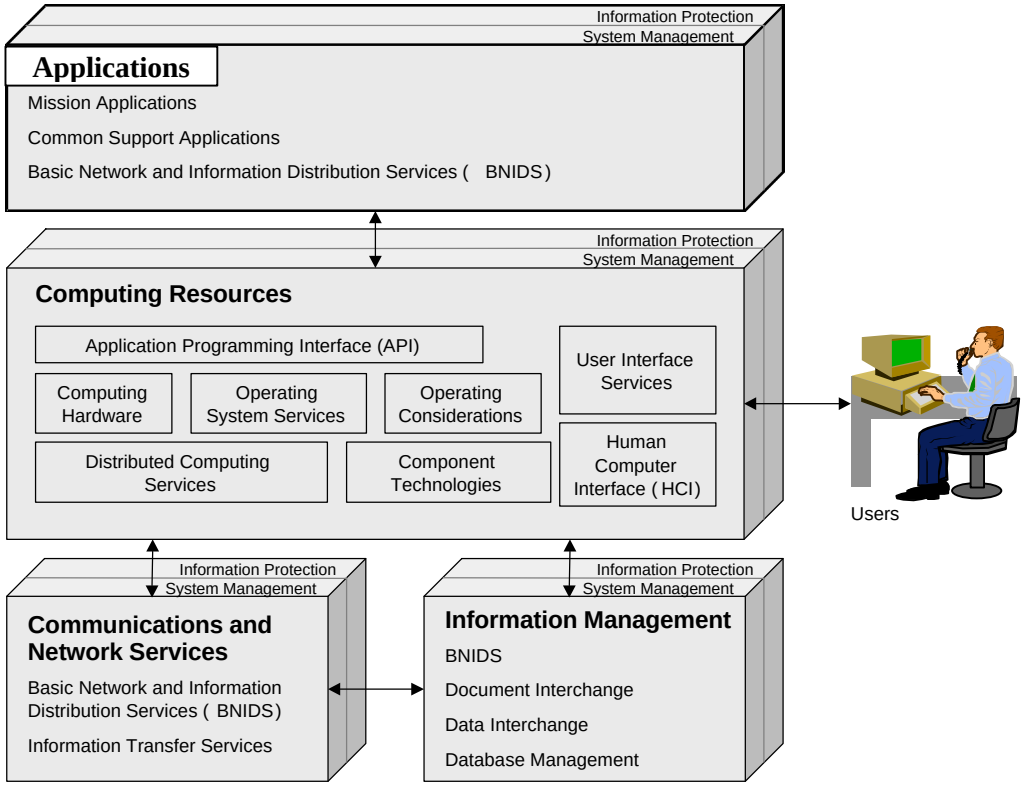


Figure 9-2. Applications in the Context of the DOD Technical Reference Model

Figure 9-2 shows the applications box that includes mission applications, common support applications and the Basic Network and Information Distribution Services (BNIDS). All of these elements consider information protection and system management. BNIDS provides basic fundamental capability to all applications and operators to connect and integrate the user with application servers, data servers, and other application subscribers. Common support applications provide capabilities to support functions common to all users above those provided in BNIDS. These applications include basic office automation functions such as word processing and database access. They also include advanced communication services such as integrated telephony, video teleconferencing and distributed collaborative planning.

- From an information technology viewpoint, applications are collections of system components that support a particular task or function. They include end-to-end, multi-media communications as well as information management and decision support capability. Applications can be self-contained and reside locally on a user's personal workstations, or they can be a system of distributed computers integrated to perform a function. Distributed computing applications require a three-tiered architecture involving: (1) application server, (2) data server, (3) presentation clients, all connected by the network (Figure 9-3) (or contained within the same computer). Communication applications normally involve a minimum of two communication devices connected by the network.

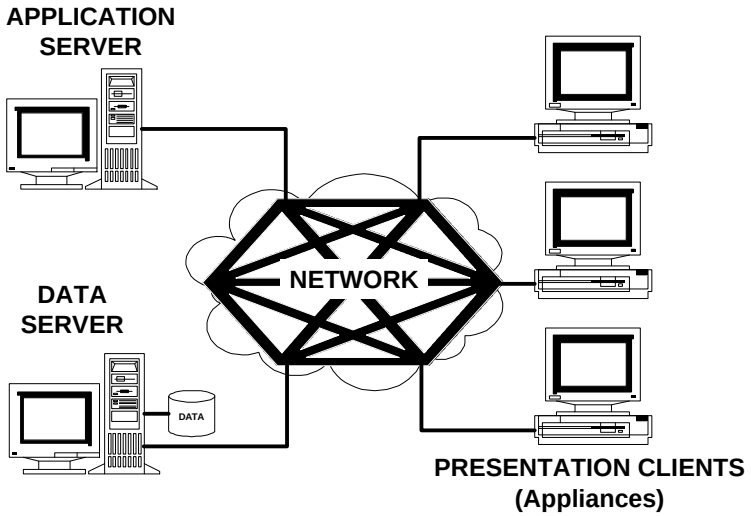


Figure 9-3. Three-Tiered Application Architecture

9.1.2 Defense Information Infrastructure Common Operating Environment (DII COE)

The Defense Information Infrastructure (DII) Common Operating Environment (COE) is a collection of reusable software components; it is a software infrastructure for supporting mission-area applications, guidelines, standards and specifications. The DII COE Integration and Runtime Specification (I&RTS), CM-400-01-03, dated 1 January 1997, outlines these guidelines and rules. It describes how to reuse existing software and properly build new software so that integration is seamless and extensively automated. The DII COE defines eight progressively deeper levels of integration for the runtime environment. These levels are directly tied to the degree of interoperability achieved. The I&RTS document is the result of collaboration among the Services, the Joint Staff , USD(A&T), ASD (C3I), DISA, DIA and other elements of the intelligence community.[12] Software implementation within the DON will be in compliance with the DII COE.

The DII COE is based on the DOD Technical Reference Model (TRM) layered architecture that defines the services and interfaces that are common to all information processing systems[13]. The top layer of the TRM depicts the mission area applications (e.g., command and control, logistics) that are focused on specific functional requirements. The second layer includes common support

[12] This paragraph is taken verbatim from Assistant Secretary of Defense letter of 2 May 1997; Subject: *Implementation of Defense Information Infrastructure Common Operating Environment Compliance*

[13] The TRM is depicted in figure 2-17 and discussed in section 2.11.2. A modified version of the TRM is provided as figure 9-2.

applications; those support the mission area applications and provide services necessary to view data in a common way. The top two layers are referred to as the application software entity and include all DOD application software. The mission area applications at layer one of the TRM are integrated into DII COE by means of a common set of Application Program Interfaces (APIs).

Applications fall into several categories – Commercial Off-The-Shelf (COTS), Government-Off-The-Shelf (GOTS), custom-developed, or a combination based upon the need to "customize" COTS or GOTS software to better support the mission requirement. Regardless of the software origin, interoperability can be achieved through consistent use of agreed-upon standards. The DII COE contains a list of both COTS and GOTS software that meets DOD interoperability requirements.

9.1.3 Beyond Software

Applications go beyond distributed software programs – they include all methods by which the user controls the information infrastructure to attain an operational or support capability. Applications in this context also include hardware or combined hardware and software systems that control, manage or transfer information. This expands the scope of applications from software programs to computer telephony, video teleconferencing (VTC), and video on demand (VOD).

9.1.4 Outline

The policy, standards and guidance that are provided in this chapter define how the applications interrelate with themselves and with the user. The grouping of specific application standards is provided to collectively address the common operating environment for applications across the DON. The topics below provide a logical approach to dealing with information technology standards as they relate to warfare and warfare support functions of the operational and functional support commands. Many of these will be combined for applications such as distributed collaborative planning and outreach education/training.

Common Support Applications – Office automation, multimedia, interpersonal communications, environment management, database utilities, graphics and imagery, and engineering support

Cooperative Work Applications – Electronic forms, workflow management, conferencing, calendaring and scheduling, and decision support

Computer Telephony – Computer intelligence for telephone supported data transactions

Video Teleconferencing – Video conferencing services for geographically dispersed activities

Mission Applications – Enterprise functional systems

Application Support Services – System (hardware and software) engineering and maintenance services

9.2 Common Support Applications

Support applications are common applications (e.g., word processing, spreadsheets) beyond BNIDS that can be standardized across individual or multiple mission areas to support enterprise wide user requirements. Support applications can provide a mission-specific service or they can provide general service. The DON policy is to use COTS products. GOTS applications may be required to meet a DON-unique need and reused in multiple information systems. It is expected that GOTS will only be required to meet mission specific applications.

Support applications also include cooperative work applications such as electronic forms, workflow management, conferencing, calendaring and scheduling, and group decision support.

9.2.1 Office Automation

Office automation services provide common office functions used in day-to-day business operations. Office automation support services include:

Word Processing Services – Creating, editing, formatting and manipulating text documents including the insertion of multimedia objects (Section 9.2.2). Includes electronic and hard-copy production.

Briefing and Presentation Services – Creating, editing, formatting, manipulating and displaying slides and handouts for presentations. Includes the insertion and manipulation of multimedia objects (Section 9.2.2).

Spreadsheet Service – Creating, calculating, manipulating and presenting information in tables or charts. This capability should include fourth-generation-language-like capabilities that enable the use of programming logic within spreadsheets.

Project Management Services - Tools that support the planning, administration, and management of projects.

Calculation Services - Including the capability to perform routine and complex arithmetic calculations.

Office Suite. Assembling each of the above services in a tightly integrated suite that maximizes ease of information content and format transfer from one application to another to maximize final product effectiveness. Includes electronic document management to allow indexing, storage and retrieval of information products.

Best Practices

Choose a commercial product that best suites the organization’s needs. This choice can be emotional because it often involves a conflict between a product that many people are familiar with at home or from previous work experience, and the product that is best for the enterprise. The products should provide enterprise information interoperability as well as working set efficiency as discussed in Section 2.1.3. It should foster easy sharing and processing of information objects (text, graphics, etc.) within the organization, community of interest, and the entire DON enterprise. The product should be compatible with groupware products discussed in Section 9.3.

Recommended Implementation

Not determined at this time.

9.2.2 Multimedia Information Processing

Multimedia services provide the capability to manipulate and manage information consisting of text, graphics, images, video, and audio. These services can be used directly by mission area applications, but they can also be used by other support applications to satisfy a common requirement. Multimedia services include:

Document processing services, including the capability to create, edit, merge, and format documents. These services enable the composition of documents that incorporate graphics, images, and even voice annotation, along with stylized text. Included are advanced formatting and editing services such as style guides, spell checking, use of multiple columns, table of contents generation, headers and footers, and outlining tools.

Electronic publishing services, including incorporation of photographic quality images and color graphics, and advanced formatting and style features such as wrapping text around graphic objects or pictures and kerning (i.e., changing the spacing between text characters). These services also interface with sophisticated printing and production equipment.

Geographic Information System (GIS) services, including the capability to create, combine, manipulate, analyze, and present geospatial (including cartography) information. This includes the creation of entity symbology that overlays the map background display and access to standard symbol libraries.

Image processing services providing for the capture, scan, creation, and edit of images in accordance with recognized image formatting standards.

Video processing services, including the capability to capture, compose, and edit video information. Still graphics and title generation services are also provided.

Audio processing services, including the capability to capture, compose, and edit audio information.

Multimedia processing services, including the capability to compress, store, retrieve, modify, sort, search, and print all or any combination of the above-mentioned media, and to perform these actions on two or more types of media simultaneously. This includes support for microform media, optical storage technology that allows for storage of scanned or computer produced documents using digital storage techniques, a scanning capability, and data compression. Additionally, multimedia processing includes hypermedia processing. Hypermedia provides the capability to create and browse documents that allow users to interactively navigate through the document using information embedded in the document.

Best Practices

Use standard commercial products for multi-media information processing.

Recommended Implementation

Not determined at this time.

9.2.3 Interpersonal Communications

Interpersonal communications services provide the capability to send, receive, forward, and manage electronic and voice messages. They also provide real-time information exchange services in support of interpersonal conferences. Additional information on electronic messaging interface standards can be found in Section 6.2.1.

Standard messaging APIs provide access to directory services, message store-and-forward capabilities, and electronic transport capabilities of e-mail message handling systems. A message type called X.435, present in the 1988 version of X.400, provides standardized support for Electronic Data Interchange (EDI) transaction transport and interchange over communications networks. This EDI message type facilitates the movement, delivery, and security of EDI transactions over X.400 networks.

An e-mail message handling system's message store-and-forward and electronic transport capabilities can be accessed by applications through the APIs listed in Table 9-1.

Best Practices

Use standard commercial products for interpersonal communications.

Recommended Implementation

	Current ITSG	Projected ITSG			
Not Recommended	**1999**	**2000**	**2001/2002**	**2003/2004**	**Emerging**
VIM	CMC/2 Extended MAPI	CMC/2 Extended MAPI	CMC/2 Extended MAPI	CMC/2 Extended MAPI	VIC
Activities, Platforms, Operational Environments		Application Developers			

Table 9-1. Data delivery: application programming interfaces

- The Vendor-Independent Messaging (VIM) interface is supported by Apple, Borland, IBM, Lotus, and Novell. Several of these suppliers are now supporting MAPI as well as VIM. Avoid using VIM because it is not widely accepted.
- The Common Messaging Call (CMC) API standard, developed by the X.400 API Association (XAPIA) in conjunction with the Electronic Mail Association (EMA), addresses compatibility issues when users write message-enabled applications. XAPIA, an international standards group of the ITU-T, is working on specifications for the basic functions of sending and receiving e-mail messages. These specifications are based heavily on Messaging Application Programming Interface (MAPI) specifications.
- APIs are being developed to address the issues of seamlessly exchanging scheduling and calendaring data. Most efforts are, however, still proprietary. One such API, Vendor-Independent Calendaring (VIC), is being developed by the Lotus Consortium and the EMA.
- MAPI is supported by Digital, Hewlett-Packard Co. (HP), Microsoft, Oracle Corp., Lotus, and Novell.
- Open Collaboration Environment (OCE), developed for the Macintosh platform by Apple, is designed to support VIM and MAPI.

9.2.4 Environment Management

This type of service is broader in scope than the other categories in that it exists primarily to manage a particular data processing and/or communications environment. Environment management services integrate and manage the execution of platform services for particular applications and users. These services are invoked via an easy-to-use, high-level interface that enables users and applications to invoke platform services without having to know the details of the technical environment. The environment management service determines which platform service is used to satisfy the request and manages access to it through the API. These services include:

Batch processing services support the capability to queue work (jobs) and manage the sequencing of processing based on job control commands and lists of data. These services also include support for the management of the output of batch processing, which frequently includes updated files or databases and information products such as printed reports or electronic documents. Batch processing is performed asynchronously from the user requesting the job.

Transaction processing services provide support for the on-line capture and processing of information in an interactive exchange with the user. This typically involves predetermined sequences of data entry, validation, display, and update or inquiry against a file or database. It also includes services to prioritize and track transactions. Transaction processing services may include support for distribution of transactions to a combination of local and remote processors.

Information presentation and distribution services are used to manage the distribution and presentation of information from batch and interactive applications. These services are used to shield mission-area applications from how information is used. They allow mission area applications to create generic pools of information without embedding controls that dictate the use of that information. Information distribution and presentation services include the selection of the appropriate formatting services required to accomplish the distribution and presentation of information to a variety of mission-area applications, support applications, and users. It also includes the capability to store, archive, prioritize, restrict, and recreate information.

Computer-based training services provide for an integrated training environment on user workstations. Training is available on an as-needed basis for any application available in the environment. Electronic notes are provided at the stroke of a key from anywhere within the application. This includes tutorial training on the application in use and the availability of off-line, on-site interactive training. The DoD on-line training environment will provide in-depth training to the new user, guidance to the novice user, and refresher material for the more experienced user. Computer-based training includes on-line documentation services. As a system service, generalized help files that have index, contents, and context-sensitive definitions must be added to all applications. The goal is for a user, through a system-managed activity, to be able to obtain help at any point, while on line.

Best Practices

Use standard commercial products for computing environment management.

Recommended Implementation

Not determined at this time.

9.2.5 Database Utilities

Database utility services provide the capability to retrieve, organize, and manipulate data extracted from a database management system. These common services provide a consistent interface to the user while providing access to a variety of databases. Database utility services include:

Query processing services that provide for interactive selection, extraction, and formatting of stored information from files and databases. Query processing services are invoked via user-oriented languages and tools (often referred to as fourth-generation languages), which simplify the definition of searching criteria and aid in creating effective presentation of the retrieved information (including use of graphics). Fourth-generation languages are generally proprietary. As yet, no public domain fourth-generation language is in wide business use.

Screen generation services that provide the capability to define and generate screens that support the retrieval, presentation, and update of data.

Report generation services that provide the capability to define and generate hardcopy reports composed of data extracted from a database.

Networking/concurrent access services that manage concurrent user access to database management system (DBMS) services.

Best Practices

Use standard commercial products for data base utilities.

Recommended Implementation

Not determined at this time.

9.2.6 Graphics and Imaging

Graphics and imaging applications provide functions required for creating, storing, retrieving, and manipulating images. These functions include services such as graphical object management, drawing services, and imaging functions.

9.2.6.1 Imaging Systems

Imaging systems have the potential to reduce the number of paper documents in an organization. Most imaging systems provide scanning, optical character recognition (OCR), indexing, storage, and retrieval components. Users may then search for content, retrieve documents, annotate (or update in OCR environments), and, in some cases, route the documents over a messaging system.

The primary purpose of these systems is to convert existing paper-based information into digital images, editable forms, plain text, or compound documents. Some imaging systems have built-in

workflow capabilities, and others may be used to create the digital objects that will be fed into a stand-alone workflow management system.

Best Practices

Choose an imaging product based on its capability to support industry-adopted standards and on the Client /Server model of computing.

Recommended Implementation

	Current ITSG	Projected ITSG			
Not Recommended	**1999**	**2000**	**2001/2002**	**2003/2004**	**Emerging**
	NITFS MIL-STD-2500A MIL-STD-188-196 MIL-STD-188-199 ANSI/ISO 8631 ISO-IEC 10981-1	NITFS MIL-STD-2500A MIL-STD-188-196 MIL-STD-188-199 ANSI/ISO 8631 ISO-IEC 10981-1	NITFS MIL-STD-2500A MIL-STD-188-196 MIL-STD-188-199 ANSI/ISO 8631 ISO-IEC 10981-1	NITFS MIL-STD-2500A MIL-STD-188-196 MIL-STD-188-199 ANSI/ISO 8631 ISO-IEC 10981-1	
Activities, Platforms, Operational Environments		Application Developers			

Table 9-2. Data delivery: application programming interfaces

- NITFS provides a package containing information about the image, the image itself, and optional overlay graphics. It was developed and mandated by ASD C3I for dissemination of digital imagery from overhead collection platforms. Guidance on applying the suite of standards can be found in MIL-HDBK-1300A. The following standards are mandated for secondary imagery dissemination:
- MIL-STD-2500A, National Imagery Transmission Format (Version 2.0) for file format.
- MIL-STD-188-196, Bi-Level Image Compression
- MIL-STD-188-199, Vector Quantization Decompression
- ANSI/ISO 8631: 1992, Computer Graphics Metafile (CGM) as profiled by FIPS 128 and MIL-STD-2301
- ISO-IEC 10918-1: 1994, Joint Photographic Experts Group (JPEG) as profiled by MIL-STD-188-198A. Although the NITFS uses the same ISO JPEG algorithm as mandated in Section 2.2.2.2.1.4.2, the NITFS file format is not interchangeable with the JFIF file format.

9.2.6.2 Three-Dimensional Computer Graphics

OpenGL is a mature standard in the engineering and business application environment. Other 3-D APIs, such as Open Inventor, support slightly different goals.

Best Practices

For new development, select OpenGL API set.

Recommended Implementation

	Current ITSG	Projected ITSG			
Not Recommended	**1999**	**2000**	**2001/2002**	**2003/2004**	**Emerging**
GKS-3-D	OpenGL	OpenGL	OpenGL	OpenGL	Open Inventor
Activities, Platforms, Operational Environments					

Table 9-3 3-D Computer Graphics

9.2.7 Engineering Support

Engineering support services include support for analysis, design, modeling, development, and simulation for a wide variety of users and environments. This includes computer-aided design services for designing, drafting, and producing engineering drawings. It also includes services provided by decision support development tools and expert system shells.

Computer-aided design (CAD) services provide high-precision drawing tools and modeling capabilities to allow production of engineering specification drawings and other precise drawings.

Decision support services provide interactive modeling and simulation tools that support analysis of alternative decisions.

Expert system services provide artificial intelligence capabilities usually based on knowledge- or rules-based inference engines that recommend or take actions based on presented situations and prior "experiences."

Modeling and simulation services provide the capability to capture or set object characteristics or attributes and parameters of a system of objects, and to portray the relationships and interactions of the objects to assist in the analysis of the system.

Best Practices

Not determined at this time.

Recommended Implementation

Choose products available on DOD contracts. Appendix D provides information on Navy contracts.

9.3 Cooperative Work Applications

Cooperative work applications, or workgroup computing, or groupware, takes advantage of personal computing and office automation by offering information sharing across the enterprise. Emerging workgroup applications, combined with technology advances, provide an environment

to allows the redesign of business processes regardless of geographic, organizational, or software boundaries.

Groupware addresses the need to facilitate and improve the unstructured communication processes of the organization. These applications include collaborative authoring, document sharing, and shared databases. The term groupware is generally defined as “computer-based systems that support groups of people engaged in a common task (or goal) and that provide an interface to a shared environment.” The groupware environment has three facets: the task or business process to be performed, the time in which individuals participate, and the location of each individual. The design point for groupware is to accomplish the business process in the most efficient manner possible by eliminating the need to work at the same place or at the same time.

Groupware tools can be categorized by functionality. The Institute for the Future originally defined the FourSquare+ model shown in Figure 9-4. The model categorizes the various forms of groupware based on the dimensions of time and place of the group interaction. The center represents the basic groupware platforms.

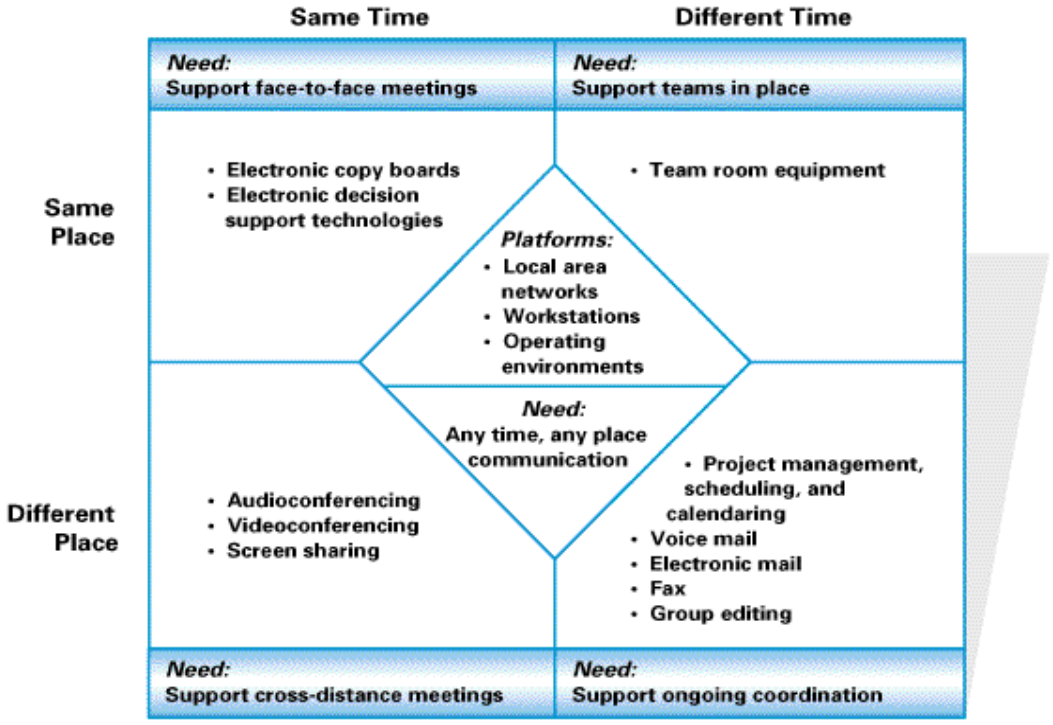


Figure 9-4. Forms of Groupware

Groupware can lead to the creation of new business data by capturing the process supported by groupware tools. The use of groupware also allows the creation and use of business data that could not previously be meaningfully manipulated. As groupware automates an individual’s work and makes it less time consuming, it allows the individual time to reengineer his/her work to accomplish more in less time.

E-mail[14] is one of many components of groupware. It is also the underlying transport mechanism or messaging layer of the groupware application suite in many groupware products. Any organization using e-mail could be said to be using groupware, but it is true only in a limited sense because there are many other components in addition to e-mail that comprise the groupware application suite.

Figure 9-5 is a graphical representation of the overlap between groupware, the World Wide Web[15], and News Groups (Usenet)[16]

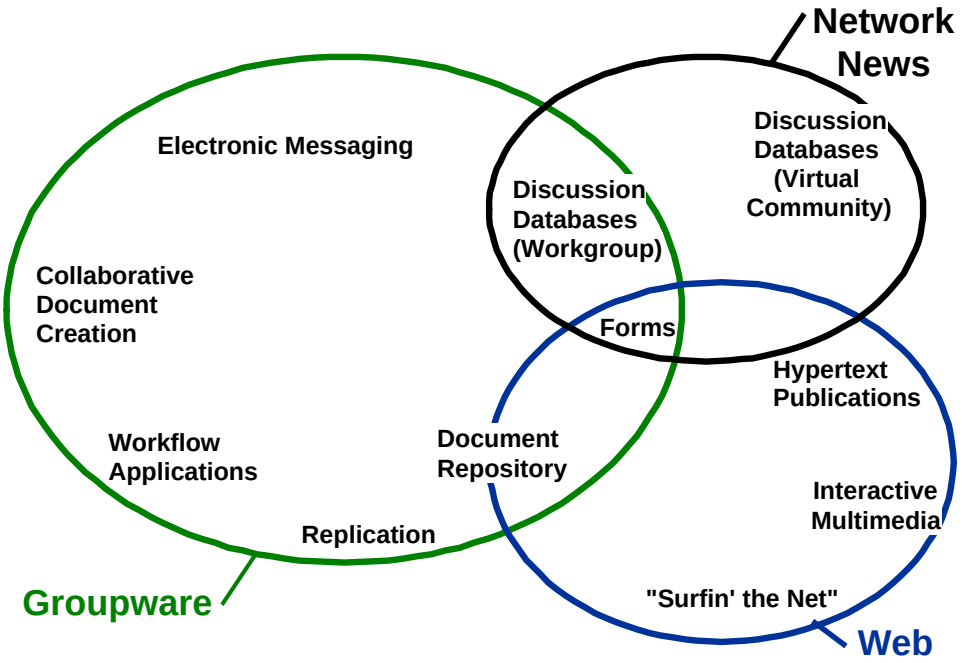


Figure 9-5. Overlap Between Groupware, The World Wide Web, and Usenet

Best Practices

Select applications and infrastructure components from vendors who are committed to complying with and promoting formal standards to implement workgroup computing

Build a groupware strategy based on an electronic mail message handling system-enabled environment that is consistent with DON strategic networking and communication architectures. This strategy allows the scope of work groups to increase over the DON enterprise and facilitates interoperability over disparate communications networks.

Choose groupware products based on their ability to support open systems standards and the client/server model of computing.

14 See Section 6.5 for a complete description of e-mail standards and guidance.
15 See Section 6.7 for a complete description of web standards and guidance.
16 See section 6.8 for a complete description of network news standards and guidance.

9.3.1 Electronic Forms

The majority of today's business forms are still produced on paper. Electronic forms tools, however, reduce a business' reliance on paper and offer capabilities for routing and tracking forms as well as directly inserting information into data bases for optimal service.

Design tools for electronic forms typically allow users or developers to specify the lines, boxes, artwork, and other elements that make form data easier to enter and read. The specification of the data portion of the form includes the information that the user types into the fields. The specification of the form processing component can provide calculation, validation, range checking, database lookup and storage, and forms routing rules.

Client applications for electronic forms allow users to complete forms and participate in a forms routing workflow process. The client applications present the forms to users, accept the input, verify that all required data is entered, and communicate with a server component to process the forms.

Best Practices

Choose an electronic forms product based on its capability to support open systems standards and the client/server model of computing. Be sure to follow the Human Computer Interface (HCI) specifications (Section 7.3.3) when the form also acts as an application interface.

Recommended Implementation

Not determined at this time.

9.3.2 Workflow Management

Workflow management applications typically route documents via an electronic mail message handling system to designated people or applications. Workflow management applications are designed to handle a document through the various stages of processing, presentation, and routing. Typical uses include processes such as purchase orders and document routing. These applications are often viewed as an excellent use of technology for making business processes more productive. Workflow tools can provide significant productivity gains when used in appropriate situations. Often existing mail systems, groupware tools or electronic forms packages can provide the necessary functionality.

Best Practices

Choose a workflow management product based on its capability to support open systems standards and the Client /Server model of computing.

Recommended Implementation

Not determined at this time.

9.3.3 Conferencing

9.3.3.1 Video Teleconferencing

Video conferencing enables people at different sites to simulate face-to-face meetings in real time. Current video conferencing equipment options range from stationary systems installed in dedicated video conferencing rooms to desktop video units. Section 9.4.9 deals with video teleconferencing in depth.

9.3.3.2 Audiographics Conferencing

Audiographics conferencing provides a more cost effective method of conferencing when seeing the conference participants is not required. The audio portion is typically a telephone conference call. The graphics portion is provided over the network and displays an image that can be modified by all participants. The graphics portion provides the enhanced capability beyond a telephone conference call. The graphic is usually referred to as a "whiteboard."

Audiographic conferencing can be more efficient than video teleconferencing because it frees participants from "visual courtesy." Participants can perform other work in-parallel when the current conference discussion is not relevant. Discipline must be maintained, however, to ensure that all participants remain sufficiently engaged.

Use audiographics conferencing when viewing and modifying a common graphic or page of a document to enhance a telephone or teleaudio conference call.

Best Practices

Not determined at this time.

Recommended Implementation

Not determined at this time.

9.3.3.3 Text Based Conferencing

Textual-based conferencing requires the lowest network bandwidth of the three types of conferencing. It provides a mechanism that allows conference participants to view each other participant's input. One of the features of the textual conference is that the text can be saved and referred to at a later time.

Use text-based conferencing as an alternative to telephone conference calls.

Best Practices

Not determined at this time.

Recommended Implementation

Not determined at this time.

9.3.4 Calendaring and Scheduling Systems

The primary benefits of calendaring and scheduling systems include reducing the time needed to schedule meetings and identifying and reserving required resources, including people, conference rooms, and equipment such as overhead projectors.

Calendaring and scheduling can provide the ability to search for the next available time when all required resources are available and define critical and non-critical resources. The systems also allow RSVPs to be accepted or rejected, changes to be made to meeting times and places, or cancellation of meetings. In addition, the systems also provide logs for meetings and personal activities.

Use an enterprise calendaring and scheduling package that supports consistent office procedures and reduces administrative effort.

Best Practices

Not determined at this time.

Recommended Implementation

Select calendaring and scheduling products that conform to TOG XCS API

9.3.5 Group Decision Support Systems

Group decision support systems are designed to increase the effectiveness of meetings. Electronic meeting support systems are decision support systems that can assist in capturing the output of brainstorming sessions, allow voting and ranking of ideas, establish priorities when resources are limited, and store the content and results of group decisions. When using an electronic meeting support system, an impartial facilitator is generally used to keep the meeting moving and to help resolve any disputes among participants. A technographer is generally used to run the master console of the software that is being used to support the meeting.

Best Practices

Use commercial off-the-shelf group decision support products that use DON's standard hardware, software, and network components. Choose group decision support system products based on their capability to support open systems standards and on the client/server model of computing.

Recommended Implementation

Not determined at this time.

9.4 Computer Telephony

Computer Telephony adds computer intelligence to making, receiving, and managing of telephone calls. Computer Telephony can be broken into three broad categories:

Messaging – voice, fax, e-mail, and unified messaging

Transaction processing – Interactive Voice Response (IVR), customer access to enterprise data, and processing of call requests without human intervention

Intelligent phone calls – Inbound and outbound call handling, "Predictive" and "Preview" dialing, information-based call routing, dialog box with customer information, and virtual (geographically distributed) call centers

Messaging and transaction processing are generally available and easy to obtain. These technologies cover predefined markets and are not covered here.

9.4.1 Computer Telephony Integration (CTI)

CTI adds intelligence to phone calls by combining two of the most commonly used business tools – the computer and the telephone. The integration of computers, networks, and Private Branch Exchange (PBX) switches adds intelligence to incoming calls by routing the call to the best person and delivers information about the caller to the person receiving the call. Additional intelligence is added to outgoing calls by placing the call without any human intervention and providing automatic call back, initiation of workflow, guaranteed quality of service for customers, and sophisticated tracking of work.

Currently, the most successful applications have automated existing manual processes. These applications have sound, easily justifiable business cases and can show rapid, measurable return on investment.

CTI solutions generally fall into one of four architectural approaches:

Phone centric – These systems implement a direct connection between switch-connected phones and PCs. This connection with the CTI application allows direct user call control.

Server centric – These systems connect PBX switches to a LAN through an intermediate telephony server, eliminating the physical connection between the PC and the phone. The LAN server routes the data associated with the call, and the PBX routes the call. The information and the call arrive at the workstation in a coordinated fashion. Call centers often use both of these systems to implement comprehensive business solutions.

PC centric – These systems connect both the PBX and the phone to an adapter in the PC. With this approach, the multimedia PC emulates the physical hand set. This approach allows the PC application to manage call control and any incoming media, whether voice or data.

LAN centric – These systems utilize a server on the network, performing the tasks of a PBX and routing calls over the network to a workstation. There is only the network connection to the workstation and no phone line connection.

Implementation of CTI solutions is dependent on sets of APIs that allow desktop computers to control telephone switch equipment. Since the predominant standards are the result of supplier activity, they are de facto in nature.

Best Practices

Select tools that support current de facto standards and enable interoperability.

Recommended Implementations

	Current ITSG	Projected ITSG			
Not Recommended	**1999**	**2000**	**2001/2002**	**2003/2004**	**Emerging**
Proprietary Implementations	TAPI V2 TSAPI Tmap S.X00 CSTA VTOA	TAPI V2 TSAPI Tmap S.X00 CSTA VTOA	TAPI V2 TSAPI Tmap S.X00 CSTA VTOA	TAPI V2 TSAPI Tmap S.X00 CSTA VTOA	JTAPI 1.1
Activities, Platforms, Operational Environments		System implementers			

Table 9-4 Computer telephony integration

- TAPI is the Microsoft/Intel Telephony API.
- TSAPI is the AT&T/Novell Telephony Services API.
- Tmap is being developed by Nortel (formerly Northern Telecom) and is designed to enable TAPI-based applications to work with PBX. Tmap itself is not an API set. Tmap provides a link between TAPI and TSAPI, thus giving TAPI the full third-party call control capability that it currently lacks over TSAPI-enabled PBXs. The Enterprise Computer Telephony Forum (ECTF) adopted Tmap, and Nortel committed to developing Tmap according to ECTF specifications.
- S.X00 is the official set of standard APIs (S.100-900) published by ECTF to provide for interoperability.
- Computer Supported Telecommunications Applications (CSTA), an API set defined by the European Computer Manufacturers Association, is supported mainly by European-based PBX suppliers.
- Java TAPI (JTAPI) is the Sun Java interface following TAPI standards.

9.5 Video Teleconferencing

Video Applications run on video teleconferencing systems and networks. These applications also make use of conferencing services available from government and industry. A discussion of entire systems and networks are provided to provide a complete understanding on how the applications are utilized.

Video conferencing for Naval forces ashore and afloat allows geographically dispersed activities to conduct face-to-face meetings in real time. Current video conferencing systems range from reservation based dedicated room systems to portable cart and desktop systems. Emerging are ATM based desktop video systems.

9.5.1 Afloat Video Teleconference Systems

Afloat Naval forces are served by the Video Information Exchange System (VIXS). The VIXS Network consists of ITU-T H.320 capable carts aboard ship connected via DSCS (military) or commercial C band SHF terminals (Challenge Athena) to any one of a number of ITU-T H.243

capable Multi-point control units (MCU's) ashore. These terminals currently range from PictureTel 4000 to 4500 series and are connected to shipboard Video distribution systems. The VIXS terminals are capable of proprietary compression algorithms and operate best while using the PictureTel SG-3 algorithm whenever possible. While SG-4, is available on some fleet units not all MCUS are capable of handling this algorithm. Consideration has been given to incorporate this (SG4) algorithm into the VIXS Network as the DON moves from the legacy system (manufacture discontinued M8000 product) to it's (MT-570) enhanced replacement model.

Best Practices

All systems must be capable of H.320 standard for standards based interoperability when shipboard systems are linked via gateways to other standards based networks.

Recommended Implementation

Proprietary compression algorithms of SG-3 to SG-4 are authorized when like capable terminals are allocated together.

9.5.2 Shore Video Teleconference Systems

9.5.2.1 Shore VIXS Network

Shore terminals within the VIXS network mirror the afloat units except for those where video monitors and cameras are external to the cart and are integrated into room systems with access and gateways to other VTC networks. Both PAC and LANT VIXS Hubs (Multipoint Control Units) have been provisioned with ISDN dial-up access ports to meet the ever-growing (DON and Allied) demand for VIXS access from ISDN capable standards based VTC systems from external shore networks. Dial-up connections can be initiated from either the subscriber or hub site master station. These secure dial-up connections use ISDN BONDING Mode 1, KIV-7 (KG-84 embedded Type 1 Encryption Device) and range in speed from 112Kbps -384Kbps (ref: IAW with FIPS-178). Would be dial-up subscribers are required to submit their Network Admission request to CNO N61 for approval. Once approved, VIXS subscribers are required to establish a system profile and perform validation testing with SPAWAR Systems Center Charleston Code 70. SPAWAR Systems Center Charleston presently validates and maintains all VIXS system profile information on behalf of CNO N61.

Best Practices

Shore access for VIXS will be controlled through designated H.243 standard Multipoint Control Units located in Hawaii, Hampton Roads, Naples, Bahrain.

Recommended Implementation

VIXS multipoint control units must provide support for standards based H.320 and proprietary algorithms of SG-3 at speeds of 112-384Kbps. Migration to SG-4 algorithm across all MCU's is recommended.

9.5.2.2 Deployable Video Teleconference Systems

Deployable VTC packages which are capable of standards based and proprietary algorithms such as the Crash-Out Package (COP) AN/MSQ-126 with the Picturetel 4500.

Best Practices

Deployable systems must comply/interoperate with shore and tactical systems and networks.

Recommended Implementation

Deployable VTC packages such as the Picturetel 4500 which is a part of the Crash-out package (COP) AN/MSQ -126 which is capable of standards based and proprietary algorithms .

9.5.2.3 Non-Tactical Shore Video Teleconference Systems

The predominance of shore systems for Navy and Marine Corps are either CLI Rembrandt (found in most DCTN schedule “D” facilities) and/or Picturetel. Various other vendors are capable of the H.320 standard, however, proprietary algorithms are preferred when like terminals are connected. For CLI Rembrandt, CTX Plus and for Picturetel SG3 and SG-4. These systems range from full-blown room systems (large VTC studios) to smaller cart systems located in offices and conference rooms.

Emerging into the video community are H.320 based desktop systems connecting individuals and small groups together via ISDN in PRI, Tri- BRI or BRI configurations. These installations also allow for fully integrated (easy to use) T.120 collaborative computing applications (application sharing), white boarding, shared clipboard and rapid file transfers. This method has proven to be an effective low-cost method of spreading VTC capability to a growing base of Naval user groups and represents an integrated voice, video, and data application.

While newer desktop systems are capable of operating in an Internet-based TCP/IP environment, this (TCP/IP) type of system is not currently recommended unless a gateway to ISDN (TCP/IP - H.320 gateway device) is provided to handle long haul connections. Further, LAN-based desktop systems be multi-purpose in that the system remains compatible with H.320 systems via an ISDN gateway and compatible to H.323/H.310 systems via the LAN or ATM-capable network. As ATM networks grow, less traffic will be routed to the ISDN gateways.

Best Practices

Maintain interoperability by implementing H.320 standard VTC systems or H.321, H.323 systems with a H.320 WAN gateway.

Recommended Implementation

Proprietary compression algorithms of CTX-Plus and SG-3/SG-4 are authorized within like capable user groups for both multipoint and point to point conferences for H.320 systems. H.261 and MPEG-2 compression standards are recommended for H.323 and H.310 respectively.

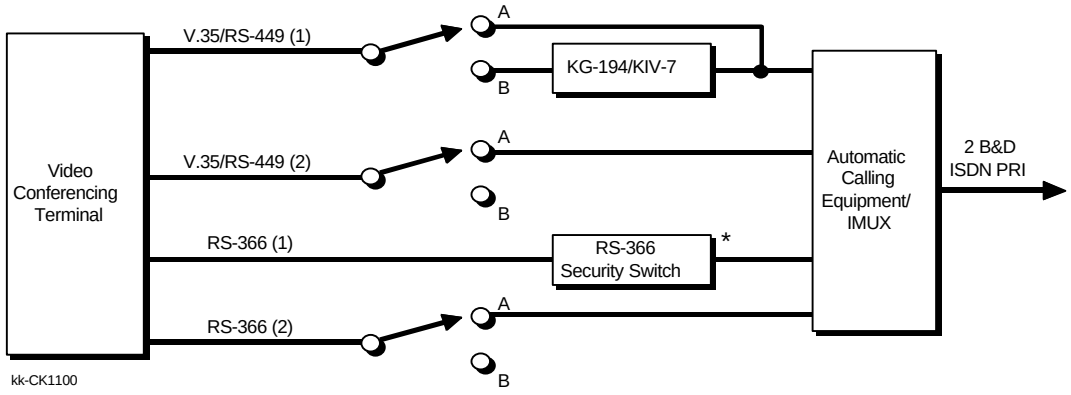
9.5.3 Security

9.5.3.1 Security for Video Conferencing

Security for video conferencing is currently provided by NSA approved type I link encryption equipment. For dedicated transmission paths, CLI Rembrants and VIXS Picturetel carts make use of KG-194's and KG-81's to provide end to end encryption. For dial-up (ISDN) video conferencing, KIV-7's are used due to their low security risk, CIK control, low cost and low profile installation. The VIXS network is a secure only network therefore all connections must be encrypted by either a KG-194 for dedicated connections or by a KIV-7 for dial-up connections. If LAN based TCP/IP video systems are used, the encryption will be moved to the H.323/H.320 ISDN gateway. Emerging equipment slated for possible VTC use are KIV-19's and Secure terminal Equipment (STE release 1 and above).

9.5.3.2 Security for Desktop VTC Systems

Figure 9-6 below suggests a configuration for supporting both classified and unclassified dial-up video conferencing. Additional precautions must be taken to insure TEMPEST integrity through all RS-449 and RS-366 connector. The configuration is notional and it is up to the local Certified TEMPEST Technical Authority (CTTA) to approved such a configuration pending official NSA approval. The suggested configuration is intended to support conferences to the SECRET level and is not intended to support either TOP SECRET or SCI-level conferencing. The system configuration consists of a video conferencing terminal acting as data terminal equipment (DTE) that includes dual V.35/RS-449 data ports and dual RS-366 dialing ports; one encryption device, one RS-366 security switch; and one Automatic Calling Equipment (ACE) such as an Inverse Multiplexor (IMUX). Also shown are three A:B bypass switches.



* Automatic connect and disconnect feature does not require A:B bypass switch

Figure 9-6. Desktop Video Configuration for Supporting Dial-up Classified and Unclassified Conferencing

Best Practices

NSA approved type I encryption devices must be used as follows:

- Dedicated Ship to shore: KG-194
- Dedicated Shore to Shore via DCTN network: KG-194
- Dial-up via VIXS Hub: KIV-7

- Secure Desktop Video via ISDN dial-up: KIV-7
- Secure LAN based Desktop Video via ISDN Wan gateway: KIV-7

9.5.4 Video Networks and Services

As for VTC networks, the Defense Video Service - Global (DVS-G) contract has been awarded to AT&T and has begun to migrate dedicated (current DCTN schedule “D” and “I” customers presently still on the DTC extension contract) rooms over to the DVS-G hubs. The DVS-G seeks to provide fully integrated mix of networks of dedicated connectivity through DISN and Dial-up through Accunet, DISN, FTS-2000, MCI and Sprint connectivity to four (initial) regional hub locations (Figure 9-7).

The DVS-G is not a network as such. It is a video service that provides the following value added features: multipoint conferencing dial-up access, dedicated access, network bridging, classified conferencing (up to TS collateral) variable data rates, reservation/scheduling service (on-line), directory service, help desk and reports (usage and performance).

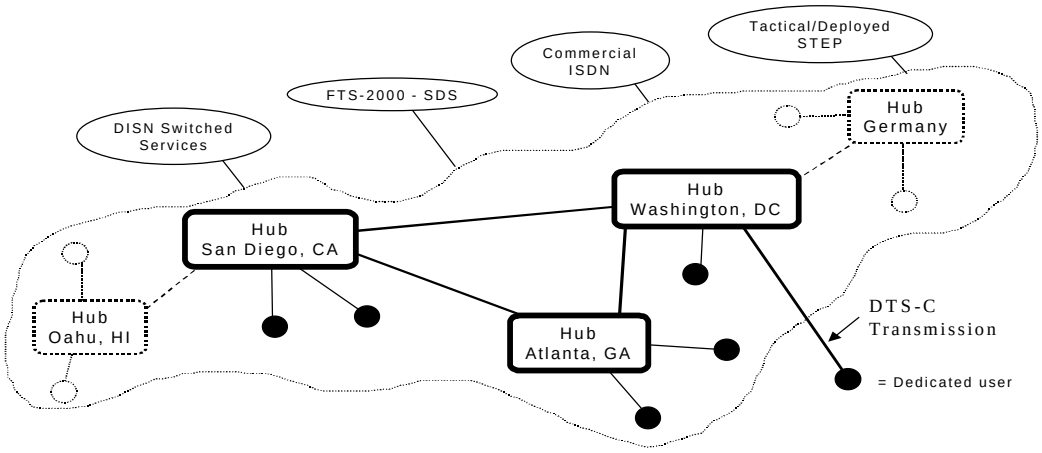


Figure 9-7. DVS-G Video Network Architecture

In addition to boardroom type VTC applications, DVS-G seeks to support a diverse group of DOD video communities such as Tele-training, Tele-medicine and Tele-maintenance. Plans have also been laid to provide video conferencing services for the tactical community (reach-back) through means of Standard Tactical Entry Points (STEP sites) within the Pacific and Atlantic theaters of operation. DVS-G also plans to provide service enhancements to keep in step with emerging Video standards such as ATM.

Other video services may also be used such as local, metropolitan, and regional video hubs due to cost of transmission to national hubs and value added features of support for higher compression algorithms and continuous presence.

Best Practices

Utilize the DISN and commercial networks for dedicated and dial -up connectivity to teleconference via services provided by regional DVS- G Hubs.

Additional regional, metropolitan, or Communities of Interest (COI) hubs are authorized to enhance conferencing services to control costs of connecting to DVS-G provided hubs.

Recommended Implementation

Not determined at this time.

9.5.5 Video Recommended Standards Summary

The ITU-T standards (H.320, H.321, H.323, H.324, and T.120) comprise the core technologies for current and emerging Navy and Marine Corps multimedia conferencing. The T.120 standards address real time data conferencing, the H.320 standards address narrow band videotelephony and terminal equipment over dedicated and switched services such as ISDN. The H.321/H.323 addresses Video communication for LANS and the H.324 standards addresses high quality video and audio compression over POTS modem connections. Table 9-5 provides a framework.

9.5.5.1 H.320 Standard

The H.320 series governs the basic video telephony concepts of audio, video and graphical communications. It specifies requirements for processing audio and video information, providing common formats for compatible audio/video inputs and outputs, and providing protocols that allow a multimedia terminal to utilize the communications links and synchronization of audio and video signals. Like other Multimedia standards, H.320 applies to multipoint and point-to-point sessions. The H.320 suite addresses video conferencing over circuit switch services like ISDN or Switched - 56 and over dedicated media. Companion standards in the H.320 umbrella are H.221- Frame structure for a 64 to 1920Kbps channel in audiovisual teleservices; and H.230- Frame-synchronous Control and Indication Signals for Audiovisual systems.

The H.321 and H.323 are emerging standards barely in use within the DON due to widespread use of systems employing the H.320 standard.

9.5.5.2 H.310 Standard

Standards H.310 and H.321 adapt H.320 to accommodate the increased bandwidth available with ATM and broadband ISDN. For backward compatibility, H.321 retains much of the structure and many of the components from H.320. For example, H.321 includes the H.261 video compression algorithm. H.310 adds the MPEC-2 video compression algorithm that provides high quality video.

9.5.5.3 H.323 Standard

H.323 describes terminals, equipment and services for multimedia communication over Local Area Networks (LAN) which do not provide a guaranteed quality of service such as packet switched networks such as Ethernet or Token ring. H.323 terminals and equipment may carry real-time voice, data and video, or any combination, including video telephony. The LAN over which H.323 terminals communicate, may be a single segment or ring, or it may be multiple segments with complex topologies. It should be noted that operation of H.323 terminals over the multiple LAN segments (including the Internet) may result in poor performance. The possible means by which quality of service might be assured on such types of LANs/internetworks is beyond the scope of this Recommendation. H.323 terminals may be integrated into personal computers or implemented in stand-alone devices such as videotelephones.

Support for voice is mandatory, while data and video are optional, but if supported, the ability to use a specified common mode of operation is required, so that all terminals supporting that media

type can interwork. This recommendation allows more than one channel of each type to be in use. Other recommendations in the H.323-Series include H.225.0 packet and synchronization, H.245 control, H.261 and H.263 video codes, G.711, G.722, G.728, G.729, and G.723 audio codes, and the T.120-Series of multimedia communications protocols.

9.5.5.4 H.324 Standard

This video standard describes terminals for low bit rate multimedia communication, utilizing V.34 modems operating over the GSTN. H.324 terminals may carry real-time voice, data, and video, or any combination, including videotelephony.

H.324 terminals may be integrated into personal computers (and Laptops) or implemented in stand-alone devices such as videotelephones. Support for each media type (voice, data, and video) is optional, but if supported, the ability to use a specified common mode of operation is required, so that all terminals supporting that media type can interwork.

Other Recommendations in the H.324-Series include the H.223 multiplex, H.245 control, H.263 video CODEC, and G.723.1 audio CODEC. The Standard makes use of the logical channel signaling procedures of Recommendation H.245, in which the content of each logical channel is described when the channel is opened. Procedures are provided for expression of receiver and transmitter capabilities, so transmissions are limited to what receivers can decode, and so that receivers may request a particular desired mode from transmitters.

H.324 terminals may be used in multipoint configurations through MCUs, and may interwork with H.320 terminals on the ISDN, as well as with terminals on wireless networks.

9.5.5.5 T.120 Standard

The T.120 standard focuses on collaborative computing, common whiteboard, and applications sharing during any H.32x video conference. The specification also allows data only T.120 sessions when no video communications are required. In addition, T.120 supports multipoint meetings with participants using different transmission media. T.120 defines communication and application protocols and services supporting real time multipoint data communications. T.120 recommendations include:

- T.122 Multipoint Communication Service
- T.123 Network Specific Transport Protocols
- T.124 Generic Conference Control
- T.126 Still Image Exchange

	ISDN H.320	POTS H.324	IP/LANs H.323	ATM H.321	Hi-Res ATM H.310
Guidance	Use where ISDN is the available transport medium . Used in dedicated configurations also	Not recommended	Use where the transport medium is IP over Ethernet, FDDI or ATM. Used in a Non QOS network	Use where the transport medium is ATM cells and the higher performance of MPEG-2 is not required. Used in QOS network	Use where highest performance over ATM cells is required.
Video	H.261	H.261 H.263	H.261 H.263 JPEG	H.261 H.263 JPEG	MPEG-2 H.261 JPEG
Audio	G.711 (NB) G.722 (WB) G.728 (CELP)	G.723	G.711(NB) G.722(WB) G.723(DUAL) G.728(CELP) G.729(CS-ACELP)	G.711(NB) G.722(WB) G.728(CELP)	MPEG-1 MPEG-2 G.7XX
Data	T.120	T.120 T.434 T.84	T.120	T.120 H.281	T.120
Multiplex	H.221	H.223		H.221	H.222.1 H.221
Signaling	H.230 H.242	H.245	H.230 H.245	H.230 H.242	H.245
Multipoint Control	H.243	N/A	N/A	H.243	N/A
Encryption	H.233 H.234	H.233 H.234		H.233 H.234	 NIA
External NSA Approved type 1 encryption	KG-194 KIV-7	TBD	KIV-7 at WAN Gateway from Classified LAN	KG-75 Between ATM Nodes; KIV-7 at WAN Gateway	KG-75 Between ATM Nodes; KIV-7 at WAN Gateway

Table 9-5 Video Standards Overview Matrix

Recommended Implementation

	Current ITSG	Projected ITSG			
Not Recommended	**1999**	**2000**	**2001/2002**	**2003/2004**	**Emerging**
	H.320 (minimum) products for: Room systems, Carts, Desktops, H.243 MCU'S DVS-G Services DISN and Commercial ISDN Networks	H.320 (minimum) products for: Room systems, Carts, Desktops, H.243 MCU'S DVS-G Services DISN and Commercial ISDN Networks H.321/H.323 LAN Video	H.320 (minimum) products for: Room systems, Carts, Desktops, H.243 MCU'S DVS-G Services DISN and Commercial ISDN Networks H.321/H.323 LAN Video	H.320 (minimum) products for: Room systems, Carts, Desktops, H.243 MCU'S DVS-G Services DISN and Commercial ISDN Networks H.321/H.323 LAN Video	IP based only Products (See the note below.)
Activities, Platforms, Operational Environments		All			

Table 9-6 Video Standards

Note

IP-based products is placed in the “Emerging” column because of their sheer commercial popularity. Their use is not recommended at this time because IP-video is not authorized over the DISN.

9.6 Mission Area Applications

Mission area applications implement specific functional user requirements and needs (e.g., payroll, accounting, materiel management, personnel, control of real-time systems, analysis of order of battle). The application software itself may be COTS or GOTS, custom developed, or a combination of these. A number of these mission area applications are being standardized across DOD. In addition to the application software, an information system includes data that can be application specific (e.g., a log of invoices and payments) or an integral part of the software (e.g., application parameters, screen definitions, diagnostic messages). Information systems also include training (e.g., tutorials and on-line help), support tools (e.g., programs for software development, self-test diagnostics), and system management aids (e.g., system administration).

Best Practices

Mission applications shall transition to DII COE and interface to common support applications to the maximum extent possible. Mission applications should consider COTS solutions where possible.

Recommended Implementation

Not provided at this time.

9.7 Application Support Services

Application support services directly support the flow of information throughout the network. These services provide a set of integrated capabilities that the application software entity (Mission Area Applications and Common Support Applications) accesses to obtain standard common operating environment services. The characteristics of the application support services are transparent to the mission and common support applications developer.

9.7.1 General Software Engineering Services

The guidance provided in this general section covers all multipurpose applications, database applications and utility applications. Separate, specific guidance is provided in Section 9.7.2 for web development.

The functionality of an application is embodied in the programming languages and methods used to develop it. Additionally, professional system developers require tools appropriate to the development, maintenance and testing of applications.

Best Practices

According to DoD 5000.2-R, it is DoD policy to design and develop software systems based on software engineering principles and shall apply to all contracted software development.

Utilize the following IEEE standards for software engineering. These standards cover the development, maintenance and testing of software applications.

Specific Policies:

- For General Applications, make use of structured multi-purpose programming languages like C++ and Visual Basic. JAVA may be used as development tools mature sufficiently.
- For Web/Internet Applications, make use of JAVA and CGI. (Active X is not recommended due to lack of security controls and lack of portability across all browsers.)
- For Utility applications (helper applications that provide additional functionality to the operating system), make use of PERL.

Recommended Implementation

See References (Section 9.5) under “Software Engineering.”

9.7.2 Web Development

Java is the latest in a long line of computer programming languages. As the most modern language, it takes advantage of several decades of lessons-learned and incorporates the latest thinking in computer science. Java is probably most easily understood as a better version of the "C" programming language that is easier and safer to use and which was designed from the start with today's object-oriented programming techniques in mind. Java was designed with a goal of "write once, run everywhere." Political and technical challenges have made this goal difficult to achieve, but not impossible. Efforts are also underway to make Java's application performance comparable with any other programming language.

Java can be used to develop either applications that augment a web browser's functionality - called applets - or stand-alone Java applications. The cross-platform nature of Java, combined with support for multimedia capabilities, has also made Java an emerging solution for delivery of multimedia content (presentations packaged as applications).

The Java language is easily extended through the addition of new Java class libraries. Therefore, any standards definition needs to address not just the core language specification, but also the extensions to the language.

The core functionality of Java is contained in the Java Foundation Classes. There are many parallel efforts underway to bring new functionality to Java through the creation of new standardized class libraries. Following are descriptions of many of these initiatives that should be incorporated into the Java language and development tools in the near future.

Java is being extended to tightly couple with the CORBA object framework. Java's distributed computing technology RMI (Remote Method Invocation) is being integrated with the CORBA protocol and the Internet Inter-ORB Protocol (IIOP). JavaSoft is also developing a JavaIDL (Interface Definition Language) specification. Once the IIOP has been extended with some of missing capabilities from RMI, RMI will be phased out. This effort supported by IBM, Oracle, Sybase, Informix, Netscape, and Novell.

Guidelines

Concerns. With any evolving standard there can be confusion among developers as to which version of the standard to work from. During 1997, many developers were still working on version 1.1, even though version 1.1.3 was out and other developers were already working with the beta 1.2 release because it had features they needed not available in previous versions. There is some danger in developing for features that the installed base of Java Virtual Machines do not yet support.

Security. Basic Java security is provided by what is known as the "sandbox model." The sandbox model limits Java applets access to the user's system resources preventing a malicious applet from doing any permanent damage. Java version 1.2 includes an extension of the Java sandbox model to work at the file-system level and the introduction of the scaleable Protection Domain Architecture.

In addition to the built-in "sandbox" protections, Java applets can be controlled through (1) the use of firewalls to keep them out, (2) the use of signed objects to certify that the applet is from a reliable source and has not been tampered with, or (3) the use of proxy applets that keep the executing applet outside the organization’s firewall.

Best Practices

Not determined at this time.

Recommended Implementation

	Current ITSG	Projected ITSG			
Not Recommended	**1999**	**2000**	**2001/2002**	**2003/2004**	**Emerging**
	Java 1.1, 1.2	Java 2.0	Java	Java	J/SQL JBDC Java IDL
Activities, Platforms, Operational Environments		Software Developers			

Table 9-7. Web Development Standards

Notes:

- Oracle, IBM and Tandem have proposed a Java language extension for accessing Relational Database Management Systems (RDBMS) called J/SQL. Every RDBMS supports SQL queries, this extension would allow Java programs to talk to directly to the leading databases. JSQL will be submitted to ISO/IEC for approval as standard.
- In addition to J/SQL there is another database connectivity initiative, known as Java Database Connectivity (JDBC). DBC is a standard set of Java classes that provides vendor-independent access to relational data. JDBC class calls get converted to Open Database Connection (ODBC) and then to vendor specific APIs.
- The International Standards Organization (ISO) has approved Java as an ISO standard. The standard includes the Java Virtual Machine, Java language specification and the Java Foundation Classes APIs. JavaSoft (the Sun Microsystems subsidiary responsible for developing the Java language) was named the organization in charge of maintenance of all the Java specifications. Sun, IBM, and Netscape have set up the Java Porting and Tuning Center to ensure compatibility across all major computing platforms and speed the introduction of Java enhancements.
- Java Development Kit - 1.2 (renamed Java 2 SDK) is now available for download at java.sun.com.

9.8 References

DII COE

Assistant Secretary of Defense Letter, Implementation of Defense Information Infrastructure Environment Compliance of 23 May 1997

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Software Engineering

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Institute of Electrical and Electronics Engineers (IEEE) standard: IEEE 828-1990 IEEE Standard for Software Configuration Management Plans (Also an ANSI standard.) 1990, http://standards.ieee.org/db/status/ (24 May 1998)

Institute of Electrical and Electronics Engineers (IEEE) standard: IEEE 829-1983 (R1991) IEEE Standard for Software Test Documentation (Also an ANSI standard.) 1983, http://standards.ieee.org/db/status/ (24 May 1998)

Institute of Electrical and Electronics Engineers (IEEE) standard: IEEE 830-1993 IEEE Recommended Practice for Software Requirements Specifications (Also an ANSI standard.) 1983, http://standards.ieee.org/db/status/ (24 May 1998)

Institute of Electrical and Electronics Engineers (IEEE) standard: IEEE 982.1-1988 IEEE Standard Dictionary of Measures to Produce Reliable Software (Also an ANSI standard.) 1988, http://standards.ieee.org/db/status/ (24 May 1998)

Institute of Electrical and Electronics Engineers (IEEE) standard: IEEE 982.2-1988 IEEE Guide for the Use of IEEE Standard Dictionary of Measures to Produce Reliable Software (Also an ANSI standard.) 1988, http://standards.ieee.org/db/status/ (24 May 1998)

Institute of Electrical and Electronics Engineers (IEEE) standard: IEEE 1002-1987 (R1992) IEEE Standard Taxonomy for Software Engineering Standards (Also an ANSI standard.) 1987, http://standards.ieee.org/db/status/ (24 May 1998)

Institute of Electrical and Electronics Engineers (IEEE) standard: IEEE 1008-1987 (R1993) IEEE Standard for Software Unit Testing (Also an ANSI standard.) 1987, http://standards.ieee.org/db/status/ (24 May 1998)

Institute of Electrical and Electronics Engineers (IEEE) standard: IEEE 1012-1986 (R1992) IEEE Standard for Software Verification and Validation Plans (Also an ANSI standard.) 1986, http://standards.ieee.org/db/status/ (24 May 1998)

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